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Published version

WILKINSON, L.L., ROWE, A.C. and MILLINGS, Abigail (2020). Disorganized attachment predicts body mass index via uncontrolled eating. *International Journal of Obesity*, 44 (2), 438-446.

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Disorganized attachment predicts body mass index via uncontrolled eating

Laura L. Wilkinson^a, Angela C. Rowe^b, Abigail Millings^c

^aDepartment of Psychology, Swansea University, Swansea, UK

^bSchool of Psychological Science, University of Bristol, Bristol, UK

^cDepartment of Psychology, University of Sheffield, Sheffield, UK

*Corresponding author: L.L.Wilkinson@Swansea.ac.uk

Running header: Disorganized attachment, eating behaviour and BMI

Competing interests statement: The authors have no competing interests to declare.

26 **Abstract**

27 **Background/Objectives:** Previous research has demonstrated relationships
28 between attachment orientations (expectations of ourselves and others in
29 interpersonal relationships), eating behaviours and obesity. However, such research
30 has been limited to investigations of 'organised' forms of attachment orientations
31 (reflecting coherent and predictable patterns of behaviour). Theoretically, aberrant
32 eating behaviours and body mass index, should also be related to 'disorganized
33 attachment.'

34 **Subjects:** Here we test these relationships for the first time in a general population.
35 Secondary data analyses of a pre-existing dataset were conducted ($N = 537$).

36 **Methods used:** Questionnaire measures of organised (avoidant and anxious) and
37 disorganized attachment were included alongside eating behaviour measures
38 (emotional eating, uncontrolled eating and cognitive restraint) and body mass index
39 (BMI).

40 **Results:** Parallel multiple mediation analysis (PROCESS) showed that uncontrolled
41 eating (but not emotional eating or cognitive restraint) significantly mediated a
42 relationship between disorganized attachment and body mass index (significant
43 indirect relationship; LLCI = .02 ULCI = .16) when both attachment anxiety and
44 avoidance were included as covariates.

45 **Conclusions:** We suggest that the mechanism underpinning this indirect
46 relationship is a form of maladaptive affect regulation, but that the behavioural
47 motivators differ from those observed in anxiously attached individuals. Rather than
48 eating being a premeditated strategy used by individuals high in disorganized
49 attachment to manage emotion, opportunities to eat are simply taken as they present
50 themselves. Professionals engaged in addressing eating problems and weight

management should consider attachment orientations in their patient assessments and be mindful that attachment disorganized individuals are especially likely to engage in uncontrolled eating behaviours that are associated with a higher BMI.

Key words: disorganized attachment; attachment anxiety; uncontrolled eating; emotional eating; cognitive restraint; body mass index

Introduction

Recent estimates have suggested that overweight and obesity will affect 2.7 billion people worldwide by 2025 ¹. Overweight and obesity are associated with an increased risk of cardiovascular disease, type 2 diabetes and cancer amongst other health issues ². As the upward trend in obesity continues ³, the need for effective interventions is of high priority ⁴.

‘Attachment orientation’ is one psychological factor that has been shown to relate to obesity and overweight in adults ⁵. Attachment orientation is a term used to describe the set of expectations that we all possess about how we and others behave in inter-personal relationships. These mental models are thought to be established early in life and reflect interactions with caregivers ⁶. Adult attachment orientations reflects the dynamics and feelings associated with our most important long-term relationships in life, including those from early life ⁷.

Currently, adult attachment orientations tends to be conceptualised in terms of two dimensions ⁷. These are attachment *anxiety* which is characterised by a fear of abandonment and attachment *avoidance* which is characterised by a fear of intimacy. A low score on both of these dimensions indicates ‘attachment security’.

76 Whilst a high score on either or both of these dimensions indicates 'attachment
77 insecurity'.

78 A recent meta-analysis showed that, in a general population, higher
79 attachment insecurity was associated with more unhealthy eating behaviours (e.g.,
80 disinhibited eating, uncontrolled eating, emotional eating amongst others) ⁸. The
81 strongest relationship was between attachment anxiety and unhealthy eating
82 behaviours, with effects tending to be of medium effect size. Importantly, disinhibited
83 eating (a general propensity to engage in periodic overeating ⁹) and emotional eating
84 (episodic overeating in response to negative affect ¹⁰) have been found to mediate a
85 relationship between attachment and BMI, ^{11, 12} respectively. This meta-analysis ⁸
86 also showed that higher attachment avoidance related to more unhealthy eating
87 behaviours, however, the effect size for this relationship was small and the weakest
88 amongst those examined (attachment insecurity, anxiety, avoidance and
89 fearfulness).

90 The mechanism underpinning these associations is thought to be affect
91 regulation; anxiously attached individuals are relatively poor at managing their
92 emotions by comparison to their attachment secure counterparts. When upsetting
93 events take place, they may seek support, but the interaction is characterised by
94 mistrust and fear of rejection rather than reassurance. Moreover, the attachment
95 system is hyperactivated leading to a hyper-vigilance to potentially upsetting stimuli
96 ^{13, 14}. To 'break the cycle' of hyperactivation, highly anxiously attached individuals
97 rely on external sources of affect regulation such as food ¹⁵. Indeed, in recent work, it
98 was shown that attachment anxiety was specifically related to an inability to both
99 disengage from the source of upset and engage in goal-oriented behaviour, which
100 was in turn related to eating in response to stress and body mass index ¹². By

contrast, attachment avoidance is associated with deactivating strategies, that is, the avoidance of emotions and suppression of stress and help-seeking (Mikulincer and Orbach, 1995). It has been suggested that this maladaptive approach does not actually eliminate stress and therefore remaining physiological stress markers and negative affect precipitate a need to engage in external affect regulation (i.e., eating). It should be noted that support for this theoretical explanation linking attachment avoidance and eating behaviour is scant compared with the better understood relationship between attachment anxiety and eating behaviour.

However, these findings focus only on 'organised' forms of attachment orientations. That is, where mental models and strategies are 'coherent' and allow individuals to select (which may be explicit or implicit) strategies to manage situations that are adaptive and predictable based on their experience of interpersonal relationships¹⁶. For example, it is logical and adaptive for the child of a neglectful caregiver to deactivate their attachment system as in attachment avoidance and seek to minimise intimacy. Even when individuals are high in both attachment avoidance and anxiety, an orientation called fearful-avoidance, they will use the hyperactivating and deactivating strategies intermittently. By contrast, adult disorganized attachment is characterised by a general fear of romantic attachment figures and refers to a lack of coherent and predictable strategies to manage the self and others¹⁶. This leads to contradictory and confused behaviour in response to distress; approach behaviours may be initiated but are left incomplete due to fear and a simultaneous desire to distance themselves¹⁷. A recent development has been the measurement of disorganisation as a construct that is separate and additional to the organised dimensions of adult attachment¹⁶.

While attachment avoidance reflects punitive or neglectful relationship experiences and attachment anxiety reflects inconsistency in relational experiences, disorganized attachment is related to child abuse, loss, trauma and otherwise frightening interpersonal experiences. Research has shown that 80% of maltreated children had a disorganized attachment pattern ¹⁸. Such adverse childhood experiences are also relevant to the understanding of obesity ¹⁹. A systematic review and meta-analysis ²⁰ not only showed a clear relationship between childhood experience of abuse and adult obesity but also severe abuse was significantly more related to obesity than less severe abuse. Suggested mechanisms underpinning this relationship included maladaptive coping responses, stress and emotional perturbations.

Considering the shared aetiology of disorganized attachment and obesity, with respect to the experience of abuse in childhood, we investigated whether a relationship between disorganized attachment, eating behaviour and BMI existed. Here, our approach was to focus on a general population and sub-clinical eating behaviours, of the kind investigated previously in relation to attachment anxiety and its relationship with BMI ¹². The ability to investigate this relationship in a large general population has been facilitated by the recent development of the adult disorganized attachment scale ¹⁶, which assesses the construct of disorganisation as a continuous dimension. Importantly, for the assessment of disorganized attachment in a general population, this approach can assess a range of levels, including relatively low scores.

Therefore, we hypothesised that higher disorganized attachment scores would relate to higher BMI and that this relationship would be mediated by measures of disinhibited eating. Specifically, we expected this relationship to exist independent

of attachment anxiety (i.e., when attachment anxiety is controlled for). Following previous research, we examined the construct of disinhibited eating with measures of uncontrolled eating and emotional eating. Uncontrolled eating is a measure of opportunistic eating in response to both internal (e.g., extreme hunger) and external (e.g., the smell of a tempting food) cues to eat¹⁰. This is a separate construct to eating as a response to negative emotion (emotional eating).

Given the contradictory nature of patterns of behaviour associated with disorganized attachment, we also tentatively hypothesised that a relationship with BMI might also be mediated by dietary restraint. Dietary restraint refers to the cognitive control over intake in order to influence body weight or shape¹⁰ and has been conceptualised as antagonistic to disinhibited eating²¹. One possibility is that the hypothesised use of eating to regulate affect by attachment disorganized individuals might precipitate reactionary dietary restraint (which has been shown to ironically lead to further disinhibited eating behaviours³¹).

In addition, using an exploratory approach based on the primary hypotheses being supported, we produced a comprehensive model that incorporated both disorganized attachment *and* attachment anxiety as predictors of body mass index via disinhibited eating behaviours.

Methods

This study is a secondary data analysis of an unpublished dataset collected for a different purpose. A brief description of the primary study and its results can be found in the supplementary information. The primary hypotheses were pre-registered with the Open Science Framework (osf.io/2dr74) following data collection but before

the data analyses associated with this paper. The dataset has been deposited for open access with the Open Science Framework (https://osf.io/2dr74/?view_only=a7bfeea11614401ca9464545ab4f620c).

Participants

A total of 752 participants began the study but 163 participants failed to complete all of the measures and were therefore excluded. We excluded a further 52 participants from our dataset because either they reported a height and weight that yielded an ambiguous or spurious BMI value (e.g., unlikely to be possible) or a BMI that was valid but considered to be below healthy-range (i.e., below 18) to minimise risk of inadvertently including disordered individuals in our sample. This resulted in a sample size of 537 (Male = 126, female = 404, other = 6, prefer not to say = 1; mean age = 25.5 years old, $SD = 9.9$). This sample size met with our requirements for adequately powering our analyses to detect effects; considering the novelty of our hypotheses a prudent approach was to power for small effect sizes within our model. Following Fritz and MacKinnon's²² guidance for detecting mediated effects with sample sizes providing .8 power using bias-corrected bootstrap approaches, we required at least a sample size of at least 462. To be eligible for the study, participants had to be over the age of 18 years old and have no current or previous diagnosis of an eating disorder.

Participants were recruited in two cohorts. In the first cohort ($n = 130$ completers), a consortium-led approach (see Button *et al.*²³) was taken by university students based at the University of Sheffield ($n = 63$ completers) and Swansea University ($n = 67$ completers). The cohort 1 sample consisted mainly of university students and staff, as the study was advertised to potential participants

who could attend a session at the universities via campus posters and student-study participation systems only. The second cohort ($n = 459$) provided only self-report height and weight and therefore were able to complete the study entirely online. They were recruited via social media, posters and student-study participation systems.

For cohort 1, ethical approval was obtained from local human research ethics committees at both sites. For cohort 2, an ethical amendment outlining a change to an online only approach was approved by local human research ethics committees at both sites. All participants provided informed consent.

Measures

Disorganized attachment The 9-item Disorganized Attachment scale¹⁶ was used. This consists of a single subscale and for the current study Cronbach's alpha for this measure was .88. Participants rated their agreement to statements about their general experience of relationships (as opposed to a specific current relationship). For example, "I never know who I am with romantic partners". Responses were provided on a 7-point Likert scale, from 1 (strongly disagree) to 7 (strongly agree).

Attachment anxiety and avoidance. The 12-item short-form Experiences in Close Relationships questionnaire²⁴ was used to assess attachment anxiety (6 items) and attachment avoidance (6 items). For the current study, Cronbach's alpha for the attachment anxiety subscale was .88 and for the attachment avoidance subscale was .84. On a seven-point scale ranging from strongly disagree to strongly agree, participants stated their level of agreement with statement referring to the

experiences of interpersonal relationships. For example, “I worry a fair amount about losing my relationships” (attachment anxiety) and “I don’t feel comfortable opening up to others” (attachment avoidance).

Eating style. The 18-item short-form three factor eating questionnaire ¹⁰ was used to assess three constructs, cognitive restraint, emotional eating and uncontrolled eating. Participants responded with the extent to which statements applied to them on a 4-point scale ranging from definitely true to definitely false or a variant of this scale depending on the question. For the cognitive restraint scale (6 items; Cronbach’s alpha for this study = .85), statements concerned the extent to which they consciously apply restraint to their eating behaviour (e.g., “I consciously hold back at meals in order not to gain weight”). For the uncontrolled eating scale (9 items; Cronbach’s alpha for this study = .86), statements concerned the extent to which they lost control over their eating behaviour (e.g., “Sometimes when I start eating, I just can’t seem to stop”). For the emotional eating scale (3 items; Cronbach’s alpha for this study = .87), statements concerned eating in response to emotional states (e.g., “When I feel lonely, I console myself with food”).

Anthropometric measures: For cohort 1, participants attended a lab session where their height and weight were measured by a researcher using a portable stadiometer and non-medical grade weighing scales respectively. For cohort 2, current height and weight were self-reported by participants using their preferred units. These were converted to metric measures. Across both cohorts, height and weight measures were used to calculate BMI (kg/m^2).

Procedure

The study was hosted on Qualtrics survey software (Qualtrics, Provo, UT, USA) and participants had to click an anonymised link to access the study. They were asked to read an information sheet and informed consent screen and to tick a box if they consented. Following this they were asked to complete all measures (those outlined here for the current study as well as those outlined in the supplementary information for the full version of the study) as well as basic demographic questions. Upon completion participants were either asked about their availability and contact information for a follow-up session for the measurement of height and weight and then debriefed (cohort 1) or asked to self-report their height and weight and then debriefed.

Data analysis

Following Price *et al.*²⁵, we merged the BMI data from the two cohorts. This decision was made on the basis that self-reported BMI and researcher-measured BMI have been found to be highly-correlated for both younger²⁶ and older adults²⁷. Nevertheless, height can be overestimated and weight can be underestimated, therefore cohort (i.e., self-report vs. measured) was entered as a covariate into our analyses, however, as it was not a significant covariate and made no difference to the results of our analyses it was trimmed from our final models.

In order to examine our primary hypotheses, a parallel mediation model was conducted. This approach was selected because it allows for the simultaneous entry of multiple mediators within a single model, such that the independent contributions of each mediator as part of an indirect pathway can be assessed. It also allowed for covariates to be entered into the model.

Our model was conducted with disorganized attachment (predictor), BMI (outcome) and parallel multiple mediators (cognitive restraint, emotional eating and uncontrolled eating). In order to isolate an effect of disorganized attachment we controlled for both attachment avoidance and anxiety. Also, following Wilkinson *et al.*^{11, 12}, we controlled for gender and age. This model was conducted using PROCESS v3.1²⁸. The covariates were controlled for at the level of both the mediator and the outcome.

Following this, a comprehensive model was produced that incorporated both findings associated with disorganized attachment (i.e., the results of the first analysis) and a replication of the significant indirect relationship between attachment anxiety, disinhibited eating measures and BMI reported in previous research^{11, 12}. This approach allows, for the first time, for the indirect effect of attachment anxiety on BMI to be tested whilst also controlling for disorganized attachment.

Therefore, path analysis was conducted using IBM SPSS AMOS. v.25.0. We included disorganized attachment, attachment anxiety, attachment avoidance, age and gender as exogenous variables, and uncontrolled eating, emotional eating and BMI as endogenous variables. Cognitive restraint was not included, as our primary analysis (above) failed to support a role for this factor. Covariance relationships were specified between each of the exogenous variables and error terms were included for each endogenous variable. Direct relationships were specified from each exogenous variable to each endogenous variable; therefore both direct and indirect relationships could be examined. Both of our model ran 5000 bootstrap samples and 95% confidence intervals are reported.

Results

Means and standard deviations for each measure and correlations between them can be found in Tables 1 and 2 respectively.

Confirmatory analyses of primary pre-registered hypotheses: Disorganized attachment, eating behaviours (cognitive restraint, emotional and uncontrolled eating) and BMI

Our parallel multiple mediation model (Fig 1) showed that there was no significant direct relationship between disorganized attachment and BMI when no mediators were included in the model (total effects) and this remained the case when mediators were included (direct effects). However, a significant indirect effect that ran between disorganized attachment and BMI via uncontrolled eating was identified. There were no significant indirect effects associated with cognitive restraint or emotional eating.

Path analysis testing a comprehensive model of the relationships between attachment orientations, disinhibited eating behaviours and BMI

Our path analysis revealed the significant indirect pathway between disorganized attachment and BMI via uncontrolled eating that was observed within our primary analysis. Also, a significant indirect pathway between attachment anxiety and BMI via emotional eating was identified. No direct effects between attachment orientations and BMI (without mediators included) were observed. Figure 2 provides a visualisation of our model, however, for the sake of legibility we have only included key relationships and statistics. Comprehensive information regarding direct

relationships relating to our specific hypotheses can be found in Tables 3 and 4 and other direct relationships can be found in the supplementary information file.

Overall a good model fit was indicated with a chi square goodness of fit statistic that was not significant ($p = .672$), a comparative fit index (CFI) of 1.00 and a root mean square error of approximation (RMSEA) of .00.

Discussion

This study has identified disorganized attachment as a novel predictor of BMI in a non-clinical population via the mechanism of uncontrolled eating. Our hypotheses were partially confirmed. The relationship between disorganized attachment and BMI was mediated by uncontrolled eating only (and not emotional eating or cognitive restraint). This highlights the importance of accounting for uncontrolled eating in individuals who present to health professionals with disorganized attachment and a high BMI.

For the first time, we can provide evidence to support a comprehensive theoretical model that incorporates both organised and disorganized attachment orientations and their relationship to eating psychopathology and BMI (Fig 2). Importantly, this speaks to a broader theoretical model that links attachment orientations to health outcomes more generally¹⁵, suggesting that an extension is required, such that it goes beyond organised forms of attachment orientations to include effects of disorganisation on health outcomes.

The most theoretically sound explanation for why disorganized attachment relates to BMI via uncontrolled eating is that these behaviours serve affect regulatory need. Specifically, whilst the motivator for eating might not be emotion, it is some other eating-related cue, the incidental reward associated with such eating

behaviours may have the unintended consequence of regulating affect. This suggestion is consistent with Paetzold *et al.*'s ¹⁶ view of disorganized attachment in two ways; firstly, disorganized attachment is associated with problematic emotion regulation - anger and hostility. When these are experienced they are associated with impulsivity and general negative emotionality, which in turn may precipitate a need for affect regulation. However, due to their conflict around support seeking (a general fear of relationships "encourages simultaneous and confused approach and avoidance of the attachment figure for support and solace in times of need" ¹⁶), highly disorganized individuals are likely to receive less support and perceive support as poorer than less disorganized individuals. External forms of affect regulation, such as disinhibition related to food consumption, may provide one of the few ways for disorganized individuals to manage their emotions.

Secondly, the characteristic incoherence of a disorganized attachment strategy is borne out here; specifically, it is likely that the affect regulatory effects of uncontrolled eating behaviours are reinforced but have failed to be translated into a coherent strategy such as 'emotional eating'. Future research is required to test these theoretical pathways; specifically, approaches to emotion regulation that might explain the relationship between disorganized attachment orientation and such eating behaviour. Moreover, the extent to which there is shared (or not) aetiology with attachment anxiety merits scrutiny.

For anxiously attached individuals, the indirect relationship between attachment anxiety and BMI via emotional eating is consistent with previous research¹². However, it is notable, that in our model it was necessary to specify a relationship running from emotional eating to uncontrolled eating (for improved model fit). This is consistent with the broader literature; recent commentary by Van

Strien ²⁹ reports on the co-occurrence of such constructs (this paper refers to external eating which is conceptually similar to uncontrolled eating) and explains it in terms of the 'escape-of-self-awareness' theory ³⁰, whereby emotional eaters narrow their attention to their immediate environment. Indeed, previous work suggests that attachment anxiety is associated with an inability to disengage with a source of upset ¹² and eating in this context allows for escape/ disengagement.

Contrary to one of our hypotheses, there was no significant relationship between disorganized attachment and cognitive restraint. This work is inconsistent with traditional 'restraint theory' ³¹, which suggests that disinhibited eating is a response to restraint. Rather, relationships with disinhibited eating behaviours were shown without respective relationships with cognitive restraint. This is more consistent with psychosomatic theory, which suggests that personality traits and psychopathology can cause disinhibited eating irrespective of restraint status ¹⁰. One speculation is that the interplay between restrained eating and disinhibited eating described within traditional restraint theory actually represents a relatively coherent strategy, whereby disinhibition is a predictable response to restraint and restraint is a predictable response to disinhibition. Such a coherent pattern of behaviour is uncharacteristic of attachment disorganized individuals. Given the novelty of this finding and our limited understanding of disorganized attachment relative to organised attachment orientations, future research should attempt to replicate this finding.

Some of our findings here are also contrary to a recent meta-analysis ⁸ which showed a significant relationship between attachment avoidance and emotional eating. We failed to find a significant relationship of this kind despite our larger sample size. A greater understanding of the role of attachment avoidance in models

of attachment orientations and eating behaviour is needed, especially given recent results suggesting that attachment avoidance actually relates to restricted eating via the mechanism of 'emotional cut-off'³². This latter finding and the failure to find a significant relationship between attachment avoidance and emotional eating in the current study are generally more consistent with our theoretical understanding of attachment avoidance; attachment avoidant individuals engage in deactivating strategies that actively minimise the experience of negative affect and cognitions³³, therefore there is no requirement to affect regulate using food in the first place.

It is notable that our findings were evident even when the mean disorganized attachment score for the overall sample was relatively low on the scale (2.82 arbitrary units; a.u.) and the maximum (6.67 a.u.) was just below the top of the scale (7 a.u.). Stronger relationships may be evident in a more clinically-relevant sample, for example bariatric-metabolic surgery patients. Previous research has shown that attachment insecurity is more prevalent in bariatric-metabolic surgery patients than in lean control populations^{34, 35} and that there is a relationship between attachment anxiety and binge eating mediated by emotion-regulation difficulties for surgery candidates³⁶. Future weight loss surgery research should consider a role for disorganized attachment given that eating psychopathologies (including those related to uncontrolled eating) initially decrease following surgery but then significantly and problematically increase in follow ups beyond a year after surgery^{37, 38}.

Previous research has shown that maternal attachment anxiety is associated with the use of feeding practices that promote child emotional eating, amongst other bidirectional effects³⁹. Future research might consider exploring the effect of parental disorganized attachment on child feeding practices. More generally it has

423 been found that parents with disorganized attachment behave in ways that may
424 engender disorganized attachment in a child ⁴⁰. Whether eating behaviours form
425 some part of this complex relationship remains to be explored.

426 More generally it should be noted that only a relatively small percentage of the
427 variance associated with BMI was explained by our models (16 -18%), which is in
428 line with previous studies ^{11, 12}. Furthermore, only correlational relationships were
429 examined here and therefore causal inferences cannot be made. One possibility is
430 reverse causality which would suggest that a higher BMI leads to disinhibited eating
431 behaviours and this affects attachment orientations. In all likelihood, a more complex
432 non-recursive relationship exists which future longitudinal work might consider. A
433 strength of our study is the inclusion of a sub-set of researcher measured height and
434 weight to derive the body mass index rather than just self-reported height and weight
435 alone.

436 This work represents a theoretical advancement of this area in line with the
437 general attachment literature which is growing with respect to our understanding of
438 adult disorganized attachment. Future work should build on the models presented
439 here to include additional demographic and individual difference level factors, for
440 example socio-economic status, which is associated with both attachment ⁴¹ and
441 BMI ⁴² and/ or neuroticism which is also associated with both eating behaviours ⁴³
442 and attachment orientations ⁴⁴.

443 In addition, given that attachment orientations are fundamentally rooted in
444 experiences with close others, it is vital that future research consider roles for social
445 relationship level variables (e.g., relationship status and social network perceptions).
446 Of particular interest is that perceived social support has been shown to moderate
447 the relationship between attachment anxiety and health-related measures ⁴⁵.

Specifically, future work could examine whether, like highly anxiously attached individuals, highly attachment disorganized individuals' health is poorer despite a high level of perceived social support compared to low attachment disorganized individuals.

Moreover, this work should inform our broader understanding of the association between attachment orientations and health outcomes ⁴⁶, models *must* consider the role of disorganized attachment over and above organised forms of attachment. Clinicians engaged in addressing eating problems and weight management should consider attachment orientations in their patient assessments and be mindful that attachment disorganized individuals are especially likely to engage in uncontrolled eating behaviours that are associated with a higher BMI. Future work might also consider whether specific interventions are more or less appropriate for use with individuals who have different attachment profiles.

Supplementary information is available at International Journal of Obesity's website.

Acknowledgements: We thank Lameise Al-Hashimi and Rebecca Buckley (Swansea University), and Laurie Hutchinson, Imogen Titjen & Ee Jing Loh (University of Sheffield) for their assistance with data collection for the primary study.

Competing Interests: The authors have no competing interests to declare.

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Figure legends:

Figure 1. Unstandardised regression coefficients are shown with standard error in brackets $B(SE)$. Values in brackets are direct effects when controlling for indirect effects. Significant indirect relationships between disorganized attachment and BMI are denoted by an asterisk and were found via uncontrolled eating ($B = .08$, ($SE = .04$), $LLCI = .02$, $ULCI = .16$) but not via cognitive restraint ($B = -.0004$, ($SE = .01$), $LLCI = -.02$, $ULCI = .02$) or emotional eating ($B = .006$, ($SE = .04$), $LLCI = -.08$, $ULCI = .1$). The overall R^2 for the model was .18.

Figure 2. An updated theoretical model of the relationship between attachment orientations and BMI via eating behaviour is presented that for the first time includes disorganized attachment. Unstandardised regression coefficients are shown with

669 standard error in brackets $B(SE)$. Significant indirect relationships are denoted by an
670 asterisk and were found for disorganized attachment and BMI via uncontrolled eating
671 ($B = .08$, $LLCI = .02$, $ULCI = .17$, $p = .002$) and attachment anxiety and BMI via
672 emotional eating ($B = .19$, $LLCI = .09$, $ULCI = .32$, $p < .001$).

673

674

Figure 1.

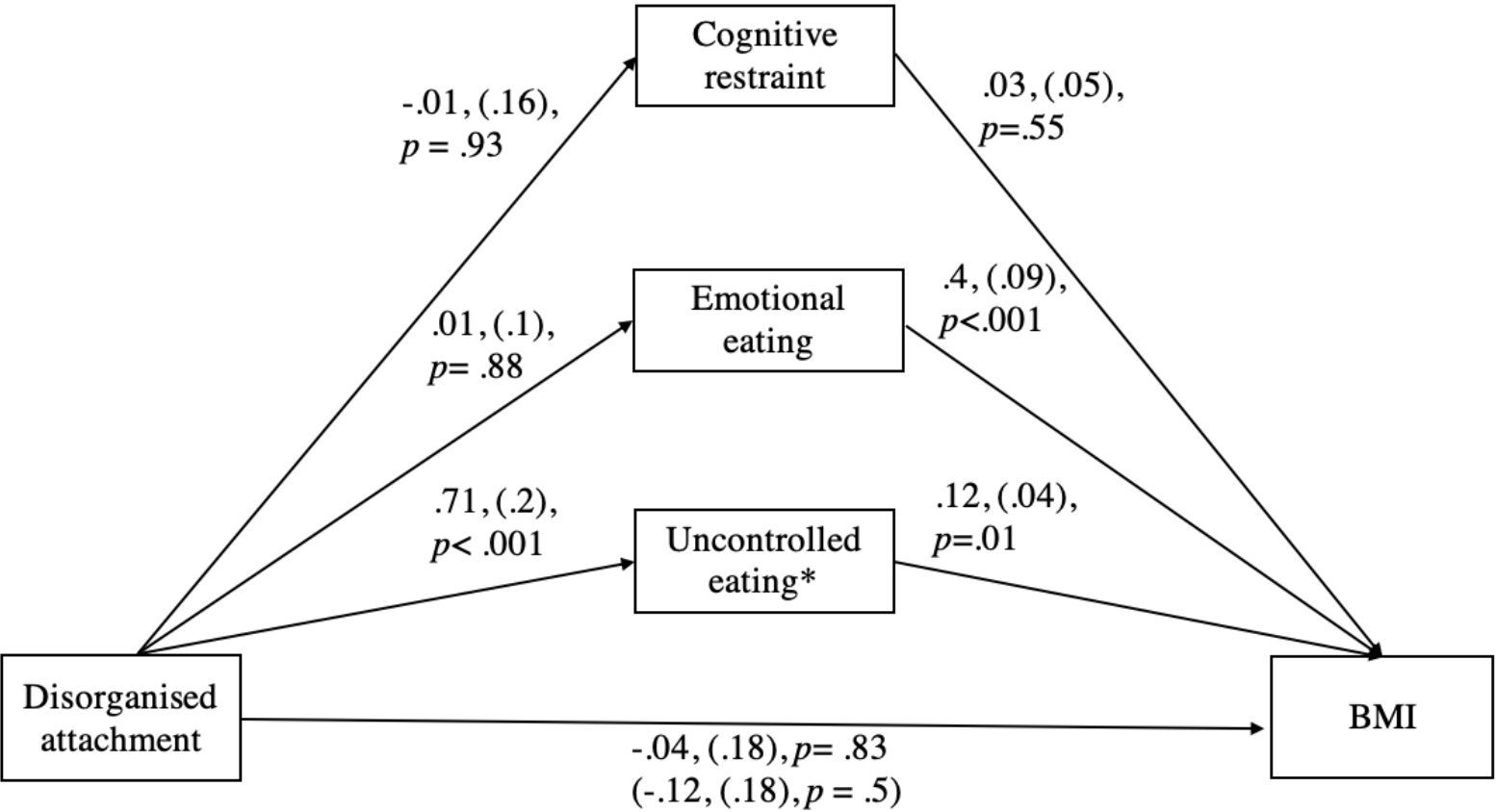


Figure 2.

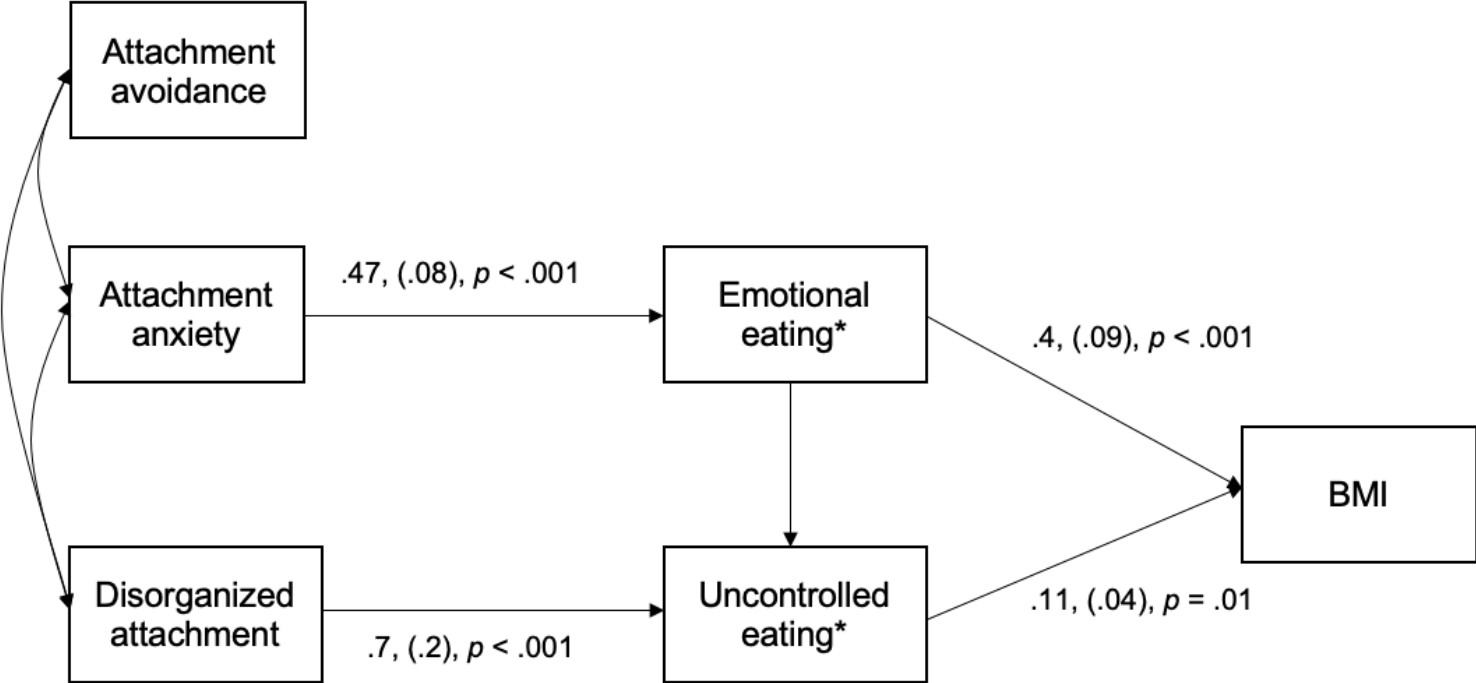


Table 1: For each measure, mean scores, standard deviation (SD) and score range are shown. Units are shown including indication when scores are arbitrary units (a.u.)

	Mean scores	<i>SD</i>	Score range
Disorganised attachment (a.u.)	2.8	1.2	1 - 7
Attachment anxiety (a.u.)	4.3	1.4	1 - 7
Attachment avoidance (a.u.)	3.5	1.2	1 - 7
Uncontrolled eating (a.u.)	20.2	4.9	9 - 36
Emotional eating (a.u.)	7.1	2.4	3 - 12
Cognitive restraint (a.u.)	12	3.8	6 - 24
BMI (kg/m ²)	23.7	4.3	18.04 - 47.5

Table 2 Pearson's correlations between each measure are shown

(* $p < .05$ ** $p < .001$)

	Emotional eating	Cognitive restraint	Attachment anxiety	Attachment avoidance	Disorganised attachment
Uncontrolled eating	.53**	0.06	.24**	0.03	.23**
Emotional eating		.13**	.32**	0.07	.14**
Cognitive restraint			.2**	0.07	0.08
Attachment anxiety				.095*	.36**
Attachment avoidance					.37**
Disorganised attachment					
BMI					
Age					

BMI	Age	Gender
.14**	-.24**	0.05
.204**	-.17**	.17**
0.05	0.02	.16**
-0.05	-.31**	.12**
-0.004	0.01	-.11**
-0.05	-.19**	0.003
	.31**	-0.03
		-.1*

Table 3. Unstandardized path coefficients, standard errors, and *t*-values for path analysis.

Path	Estimate	SE	<i>t</i>	<i>p</i>
Disorganised attachment to UE	0.7	0.18	3.9	<.001
Disorganised attachment to EE	0.02	0.1	0.15	0.88
Disorganised attachment to BMI	-0.15	0.16	-0.92	0.36
Attachment anxiety to UE	-0.01	0.15	-0.09	0.93
Attachment anxiety to EE	0.47	0.08	5.96	<.001
Attachment anxiety to BMI	-0.04	0.14	-0.31	0.76
UE to BMI	0.11	0.04	2.58	0.01
EE to BMI	0.4	0.09	4.5	<.001

*Additional information about other direct pathways can be found in the supplementary information file.

Table 4: Specific indirect effects and their respective confidence intervals and p-values for the path model

	Indirect effect	Bias- corrected 95% CI	<i>p</i>
Disorganised attachment to UE to BMI	0.08	.02, .17	0.002
Disorganised attachment to EE to BMI	0.01	-.08, .1	0.91
Attachment anxiety to UE to BMI	-0.001	-.04, .04	0.87
Attachment anxiety to EE to BMI	0.19	.09, .32	<.001